

IN THE CLAIMS:

1-11. (Cancelled)

12. (Canceled)

13. (Currently Amended) An optical node interconnected in an optical communication system having the optical node and plural other optical nodes, the optical node comprising:

[[a line side receive]] at least one interface to receive one or more of a plurality of optical wavelengths including a test optical wavelength, from one of the other nodes that originated the test optical wavelength, ~~and, a line side transmit interface to~~ transmit one or more of the plurality of optical wavelengths, including the test optical wavelength; [[and]]

a loopback mechanism operable to perform looping back of the one or more of the plurality of optical wavelengths, including the test optical wavelength, received at the [[line side receive]] at least one interface, back towards [[to]] the [[line side transmit]] at least one interface without converting the optical wavelengths to electrical form; and

a multiplexer/demultiplexer interposed between the loopback mechanism and the at least one interface,

wherein the one or more of the plurality of optical wavelengths are applied through the multiplexer/demultiplexer after being received at the at least one interface and after being looped back by the loopback mechanism.

14. (Currently Amended) An optical node comprising:

a first optical line terminal having an all-optical-pass-through port side interface including a plurality of port side transmit ports, each to transmit a [[different]] respective one of a plurality of optical wavelengths, and a plurality of associated port side receive ports, [[each]] to receive [[the different one]] respective ones of the plurality of optical wavelengths, the first optical line terminal including at least one transponder connected to a predetermined one of the transmit ports and also connected to [[the]] an associated one of the port side receive ports, the at least one transponder including a loopback mechanism to perform looping back of [[the received]] an optical wavelength received at the associated one of the port side receive ports to the predetermined one of the port side transmit ports;

a second optical line terminal having an all-optical-pass-through port side interface including a plurality of port side transmit ports, each to transmit a [[different]] respective one of the plurality of optical wavelengths, and a plurality of associated port side receive ports, [[each]] to receive [[the different one]] respective ones of the plurality of optical wavelengths, the second optical line terminal including at least one transponder connected to a predetermined one of the port side transmit ports and also

connected to [[the]] an associated one of the port side receive ports, the at least one transponder including a loopback mechanism to perform looping back of [[the received]] an optical wavelength received at the associated one of the port side receive ports to the predetermined one of the port side transmit ports; and

an optical connection, optically connecting at least one of the port side transmit ports of the first optical line terminal to at least one of the port side receive ports of the second optical line terminal, and connecting [[the associated]] at least one port side receive port of the first optical line terminal to [[the associated]] at least one transmit port of the second optical line terminal.

15. (Currently Amended) An optical network comprising:

n, where n is an integer, optical nodes, including a source node to provide an optical signal that includes a test optical signal, and a [[destination]] loopback node to [[receive]] loop back the optical signal that includes the test optical signal towards the source node; and

optical fibers optically connecting the n nodes, and to carry the optical signal including the test optical signal [[from]] between the source node [[to]] and the [[destination]] loopback node via intermediate nodes[; and],

wherein the loopback node comprises

at least one receive interface coupled to at least one optical fiber connected to the loopback node,

at least one transmit interface coupled to at least one optical fiber connected to the loopback node,

an optical loop-back circuit, coupled to the at least one transmit interface and the at least one receive interface, to perform looping back of the optical signal including the test optical signal ~~at any one of the nodes to a preceding~~ towards the source node without converting the optical signal including the test optical signal to an electrical signal, and

at least one multiplexer/demultiplexer interposed between the optical loop-back circuit and each of the at least one receive interface and the at least one transmit interface.

16. (Currently Amended) An optical line terminal comprising:

[[a line side]] an interface having a receive port to receive an optical signal, including a test optical signal, that originated from an originating optical node; ~~a line interface having a line side~~ and also having a transmit port to transmit the optical signal, including the test optical signal, back to the originating node;

at least one further communication interface;

at least one transponder coupled between the interface and the at least one further communication interface, the at least one transponder being coupled to the at least one further communication interface through at least one communication terminal

of the at least one transponder, the at least one transponder also having a transmit output terminal and a receive input terminal; [[and]]

at least one optical switch having four terminals, with a first terminal connected to the [[line side]] receive port and a second terminal connected to the [[line side]] transmit port of the [[line]] interface, and a third terminal connected to the receive input terminal and a fourth terminal connected to the transmit output terminal of the at least one transponder, the at least one optical switch having a normal state in which a first optical path is provided from the first terminal to the third terminal of the at least one optical switch to provide an optical connection from the [[line side]] receive port of the [[line]] interface to the receive input terminal of the at least one transponder, and a second optical path is provided from the second terminal to the fourth terminal of the at least one optical switch to provide an optical connection from the transmit output terminal of the at least one transponder to the [[line side]] transmit port of the [[line side]] interface, the at least one optical switch having a loopback state in which a third optical path is provided from the first terminal to the second terminal of the at least one optical switch to loopback the optical signal including the test optical signal received at the [[line side]] receive port to the [[line side]] transmit port of the [[line]] interface, and a fourth optical path is provided from the third terminal to the fourth terminal of the at least one optical switch to loopback the optical signal including the test optical signal transmitted from the transmit output terminal to the receive input terminal of the at least one transponder, wherein while in the

loopback state, the at least one optical switch does not convert the optical signal, including the test optical signal, to electrical form; and

at least one multiplexer/demultiplexer optically coupled between the  
at least one communication terminal of the at least one transponder and the at least one  
further communication interface.

17. (Currently Amended) An optical line terminal comprising:

[[a line side]] an interface having a receive port to receive [[an]]  
optical signals, ~~including a test optical signal, that originated from an originating optical~~  
~~node; a line interface having a line side~~ and a transmit port to transmit [[the]] optical  
signals, ~~including the test optical signal, back to the originating node;~~

at least one line side communication interface;

at least one transponder coupled between the interface and the at  
least one line side communication interface, the at least one transponder being coupled to  
the at least one line side communication interface through at least one communication  
terminal of the at least one transponder, the at least one transponder also having a transmit  
output terminal and a receive input terminal; [[and]]

at least one optical switch to either perform at least one of looping  
back [[the]] an optical signal, ~~including the test optical signal,~~ received at the [[line side]]  
receive port to the [[line side]] transmit port of the [[line side]] interface, and looping back  
[[the]] an optical signal, ~~including the test optical signal,~~ transmitted from the transmit

output terminal to the receive input terminal of the at least one transponder, or perform forwarding of at least one optical signal between the interface and the at least one line side communication interface through the at least one transponder, the optical switch having first and second switch terminals connected to the ~~[[line side]]~~ transmit port and ~~[[line side]]~~ receive port, respectively, of the ~~[[line]]~~ interface, and having third and fourth switch terminals connected to the transmit output terminal and the receive input terminal, respectively, of the at least one transponder, wherein when performing looping back, the optical switch does not convert the optical signal, ~~including the test optical signal,~~ to electrical form; and

at least one multiplexer/demultiplexer optically coupled between the at least one communication terminal of the at least one transponder and the at least one line side communication interface.

18-29. (Cancelled)

30. (Currently Amended) An optical line terminal, comprising:

a line interface having a line side transmit port to transmit an optical signal and a line side receive port to receive an optical signal;

a port side interface having a port side transmit port to transmit an optical signal and a port side receive port to receive an optical signal;

and a transponder connected to the line side transmit port and the line side receive port of the line side interface, and also connected to the port side transmit port and port side receive port of the port side interface, the transponder including a loopback mechanism to perform at least one of looping back of the received optical signal at the line side receive port to the line side transmit port and looping back of the received optical signal at the port side receive port to the port side transmit port,

wherein the loopback mechanism comprises:

a first switch connected to switch the received optical signal at the line side receive port between a first path leading to the port side transmit port and a second path leading to the line side transmit port;

a second switch connected to select between the second path and a third path leading from the port side receive port and to provide an output leading to the line side transmit port;

a third switch connected to select between the first path and a fourth path leading from the port side receive port and to provide an output leading to the port side transmit port; and

a fourth switch connected to switch the received optical signal at the port side receive port between the third path leading to the line side ~~[[receive]]~~ transmit port and the fourth path leading to the port side transmit port.

31. (Currently Amended) An optical line terminal, comprising:



a line interface having a line side transmit port to transmit an optical signal and a line side receive port to receive an optical signal;

a port side interface having a port side transmit port to transmit an optical signal and a port side receive port to receive an optical signal;

a transponder connected to the line side transmit port and the line side receive port of the line side interface, and also connected to the port side transmit port and port side receive port of the port side interface, the transponder including a loopback mechanism to perform one of looping back the received optical signal at the line side receive port to the line side transmit port and looping back the received optical signal at the port side receive port to the port side transmit port; and

a multiplexer/demultiplexer connected between the transponder and the ~~[[port]]~~ line side transmit and receive ports.

32. (Currently Amended) The optical node of claim 13, further comprising:

~~[[a second line side]]~~ at least one further ~~[[transmit]]~~ interface to transmit one or more of a plurality of optical wavelengths; ~~and an associated second line side receive interface~~ and receive one or more of a plurality of optical wavelengths,

wherein the loopback mechanism also is operable to loop back one or more of the plurality of optical wavelengths received at the ~~[[second line side receive]]~~

further interface back towards [[to]] the [[second line side transmit]] further interface without converting the optical wavelengths to electrical form.

33. (Currently Amended) The optical node of claim 32, wherein the loopback mechanism comprises a 2x2 optical switch ~~having a first input port connected to receive at least one of the optical wavelengths received at the line side receive interface, the optical switch being adapted to output the received optical wavelength from a first output port to the line side transmit port or from a second output port, the optical switch further having a second input port.~~

34. (Currently Amended) An optical node comprising:

- a first [[line side]] transmit interface to transmit one or more of a plurality of optical wavelengths;
- [[an associated line side]] a first receive interface to receive one or more of a plurality of optical wavelengths;
- a loopback mechanism ~~to perform looping back of one or more of the plurality of optical wavelengths received at the line side receive interface to the line side transmit interface without converting the optical wavelengths to electrical form~~ comprising a 2x2 optical switch;
- a second [[line side]] transmit interface to transmit one or more of a plurality of optical wavelengths;

~~an associated second line side~~ a second receive interface to receive one or more of a plurality of optical wavelengths; and

a multiplexer/demultiplexer connected between the ~~[[line side]]~~ first transmit and receive ports and the 2x2 optical switch,

wherein the loopback mechanism is operable to perform at least one of looping back one or more of the plurality of optical wavelengths received at the second ~~[[line side]]~~ receive interface to the second ~~[[line side]]~~ transmit interface ~~without converting the optical wavelengths to electrical form and the loopback mechanism comprises a 2x2 optical switch having a first input port connected to receive at least one and looping back one or more of the plurality of optical wavelengths received at the~~ ~~[[line side]]~~ first receive interface to the first transmit interface, each looping back being performed without converting the one or more of the plurality of optical wavelengths to electrical form , the optical switch being adapted to output the received optical wavelength from a first output port to the line side transmit port or from a second output port, the optical switch further having a second input port.

35. (Currently Amended) The optical node of claim 33, wherein the loopback mechanism further comprises a ~~[[second]]~~ further 2x2 optical switch ~~having a first input port connected to receive at least one of the optical wavelengths received at the second line side receive interface, the second optical switch being adapted to output the~~

~~received optical wavelength from a first output port to the second line side transmit port or from a second output port, the second optical switch further having a second input port.~~

36. (Currently Amended) An optical node comprising:

a ~~[[line side]]~~ first transmit interface to transmit one or more of a plurality of optical wavelengths;

~~[[an associated line side]]~~ a first receive interface to receive one or more of a plurality of optical wavelengths;

at least one line side communication interface;

~~a loopback mechanism to perform looping back of one or more of the plurality of optical wavelengths received at the line side receive interface to the line side transmit interface without converting the optical wavelengths to electrical form;~~

a second ~~[[line side]]~~ transmit interface to transmit one or more of a plurality of optical wavelengths;

~~an associated second line side~~ a second receive interface to receive one or more of a plurality of optical wavelengths; and

~~[[wherein the]]~~ a loopback mechanism ~~[[is]]~~ operable to perform at least one of looping back one or more of the plurality of optical wavelengths received at the second ~~[[line side]]~~ receive interface to the second ~~[[line side]]~~ transmit interface, or looping back one or more of the plurality of optical wavelengths received at the first

receive interface to the first transmit interface, each looping back being performed without converting the optical wavelengths to electrical form, [[and]]

wherein the loopback mechanism comprises a first 2x2 optical switch having a first input port connected to the first receive at least one of the optical wavelengths received at the line side interface, a second input port connected to the line side communication interface, a first output port connected to the line side communication interface, and a second output port connected to the first transmit interface, receive interface, the first optical switch being adapted to output the received optical wavelength from a first output port to the line side transmit port or from a second output port, the first optical switch further having a second input port, wherein the loopback mechanism further comprises a second 2x2 optical switch having a first input port connected to the second receive interface, a second input port connected to the at least one line side communication interface, a first output port connected to the at least one line side communication interface, and a second output port connected to the second transmit interface, receive at least one of the optical wavelengths received at the second line side receive interface, the second optical switch being adapted to output the received optical wavelength from a first output port to the second line side transmit port or from a second output port, the second optical switch further having a second input port, and

wherein the optical node further comprises [[a second]] at least one multiplexer/demultiplexer [[connected]] interposed between and connected to the [[second

line side]] at least one line side communication interface and the first ~~transmit and receive~~  
ports and [[the]] second 2x2 optical switches.

37. (Currently Amended) The optical node of claim 13, wherein the loopback mechanism comprises a 2x2 optical switch ~~having a first input port connected to receive at least one of the optical wavelengths received at the line side receive interface, the optical switch being adapted to output the received optical wavelength from a first output port to the line side transmit port or from a second output port, the optical switch further having a second input port.~~

38. (Currently Amended) The optical network of claim 15, ~~further comprising:~~

- ~~a line side transmit interface to transmit one or more of a plurality of optical wavelengths to the optical nodes;~~
- ~~an associated line side receive interface to receive one or more of a plurality of optical wavelengths from the optical nodes;~~
- ~~a second line side transmit interface to transmit one or more of a plurality of optical wavelengths to the optical nodes; and~~
- ~~an associated second line side receive interface to receive one or more of a plurality of optical wavelengths from the optical nodes;~~

wherein the optical loop-back circuit comprises at least a first 2x2 optical switch having a first input port connected to receive at least one of the optical wavelengths received at the ~~[[line side]]~~ at least one receive interface, the optical switch being adapted to output the received optical wavelength from a first output port to the ~~[[line side]]~~ at least one transmit interface ~~port or from a second output port, the optical switch further having a second input port.~~

39. (Currently Amended) The optical network of claim 38, wherein the loopback node further comprises

at least one further receive interface; and

at least one further transmit interface,

wherein the optical loop-back circuit further comprises a second 2x2 optical switch having a first input port connected to receive at least one of ~~[[the]]~~ optical wavelengths received at the ~~[[second line side]]~~ at least one further receive interface, the second optical switch being adapted to output the received optical wavelength from a first output port to the ~~[[second line side]]~~ at least one further transmit interface ~~port or from a second output port, the second optical switch further having a second input port.~~